

Approved by:

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Process Engineer\_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
Equipment Engineer

## **1 SCOPE**

The purpose of this document is to detail the use of the CHA Flash Source. All users are expected to have read and understood this document. It is not a substitute for in-person training on the system and is not sufficient to qualify a user on the system. Failure to follow guidelines in this document may result in loss of privileges.

## **2 REFERENCE DOCUMENTS**

- Material Safety Data Sheet for material being evaporated
- Appropriate Tool Manuals

## **3 DEFINITIONS**

n/a

## **4 TOOLS AND MATERIALS**

### **4.1 General Description**

- 4.1.1 This evaporator is set up to deposit aluminum with a wire feed on a heated bar using thermal evaporation.

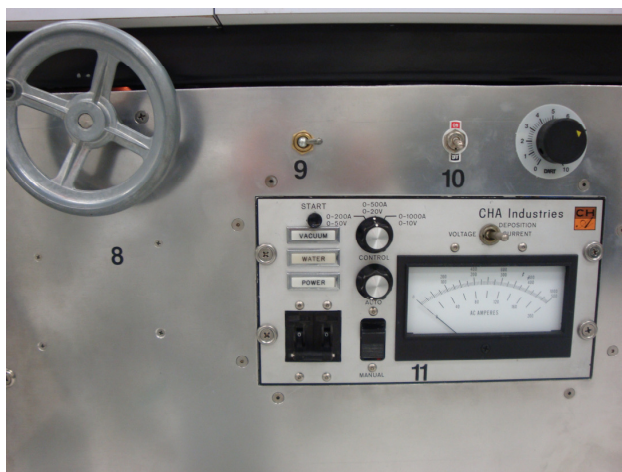
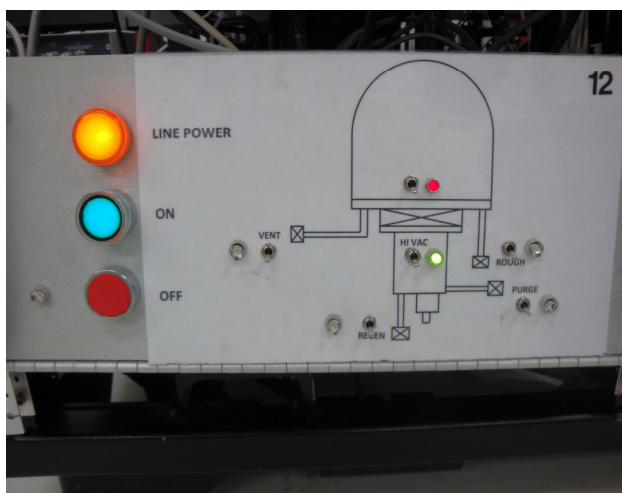
### **4.2 Wafer Holders**

- 4.2.1 Wafer holders for various sized substrates are available.

### **4.3 Evaporant Sources**

- 4.3.1 Al wire on a spool inside the tool is supplied.

**4.4 Front of tool**



## 5 SAFETY PRECAUTIONS

### 5.1 Personal Safety Hazards



5.1.1 In the event of an emergency or any other serious problem depress EPO button (labeled EPO on machine).

5.1.2 The CHA Evaporator employs voltages that are dangerous and may be fatal to personnel. Do not attempt to defeat protective interlock systems.

5.1.3 The CHA Evaporator bell jar is heavy and can pinch fingers or other body parts against the vacuum base plate. Keep fingers and loose objects away from the bell jar sealing surface when lowering the bell jar.

**KEEP HANDS AND HEAD OUT OF UNIT WHEN CLOSING.**



5.1.4 Various internal components of the CHA Evaporator become very hot during evaporation of metals. These components remain hot for some time after the bell jar is opened, and can burn fingers if touched. Use caution when removing substrate holders.

5.1.5 Various internal components of the CHA evaporator, which include shields and glass slides, may have sharp edges. Use caution when working with these fixtures to prevent cuts.

5.1.6 Dust and other small metal fragments can be flammable, or irritating to the respiratory tract or eyes. Use caution when working with fixtures or cleaning the chamber to prevent exposure to flakes and dust.

### 5.2 Hazards to the Tool

5.2.1 Failure to clean up chamber and fixtures after use - Flaking metal deposits on shields and fixtures can generate large quantities of particulates which can contaminate wafers or compromise vacuum performance of the tool.

5.2.2 Damage to bell jar vacuum seal – contact with tools or other objects, or contaminants like flakes or particles, can damage the sealing integrity of the vacuum chamber. Use caution when working with the open bell jar and avoid damaging the rubber seal or the flat base plate mating surfaces.

5.2.3 Deposition on viewports – If possible, sources should be provided with mirrors for viewing rather than having line-of-sight to a viewport.

## 6 INSTRUCTIONS

### 6.1 Service Chase Setup

- 6.1.1 Turn on the Vent N<sub>2</sub> for **CHA Flash Source** behind tool. (Green handle inside lower section of wall behind tool labeled **CHA FLASH NITROGEN**. Make sure the Nitrogen pressure is about 15psi.)
- 6.1.2 Make sure the air pressure is about 75psi. (Behind Tool)
- 6.1.3 Make sure the air pressure for the shutter is about 12psi. (right rear of tool)

### 6.2 Start Up

- 6.2.1 **Panel 4** – Ensure Cryo Rough displays 0mTorr, if not get a technician.
- 6.2.2 Swipe In. The Control Panel will display:



- 6.2.3 **Panel 3** - Turn on Inficon XTM/2 Deposition Controller. Press <**STOP**>
- 6.2.4 **Panel 2** - Press <**GAUGE**> on GP 330 Ionization Gauge Controller. Unit should not display anything.
- 6.2.5 **Panel 5** - Press <**STOP**> on Control Panel.
- 6.2.6 **Panel 5** - Press <**VENT**> on Control Panel.
- 6.2.7 **Panel 12** - HiVac Valve will close indicated by light going out.

- 6.2.8 **Panel 12** - After 30sec Vent will initialize indicated by the Vent light illuminating.
- 6.2.9 **Panel 7** - Observe Pirani Gauge Controller. Pressure should be rising. Unit is vented when N<sub>2</sub> is heard escaping from bell jar. Control panel will indicate **ATM**.
- 6.2.10 **Panel 1** - Operate both switches to the up position simultaneously to raise the bell jar.

**Bell Jar will not rise without both switches activated  
at the same time.**

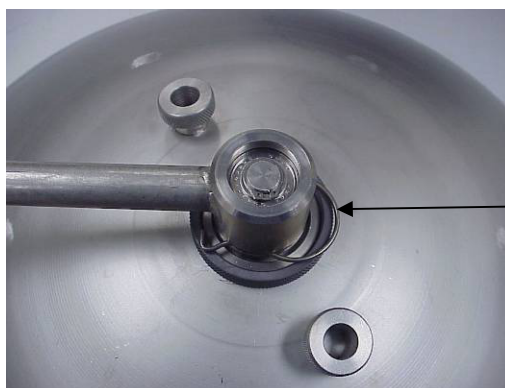
- 6.2.11 Open Bell Jar until it stops. This may seem hi but it will stop.
- 6.2.12 **Panel 5** - Press <**STOP**> on the Control Panel.
- 6.2.13 **Panel 3** – Press <**LIFE (1)**>. If display is 15% or higher then crystal needs to be replaced. See tech for assistance.

### 6.3 Loading Wafers

- 6.3.1 Remove Planetary Dome and set on a flat surface. **Do not hold the planetary by the arm only, as it may fall off and damage the planetary and/or your wafers.**

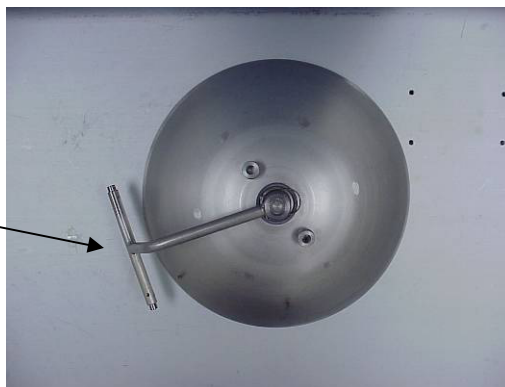


## 6.3.1.1 Remove retaining clip from back of planetary



Retaining Clip

## 6.3.1.2 Remove holding arm by lifting straight up



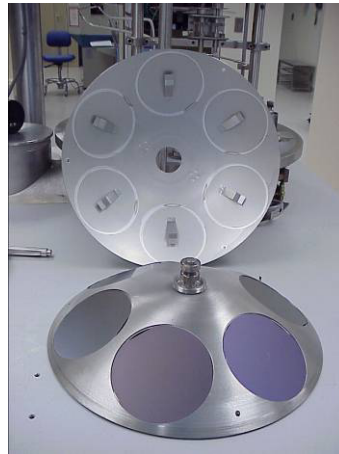
Holding Arm

## 6.3.1.3 Unscrew backing nut to separate planetary



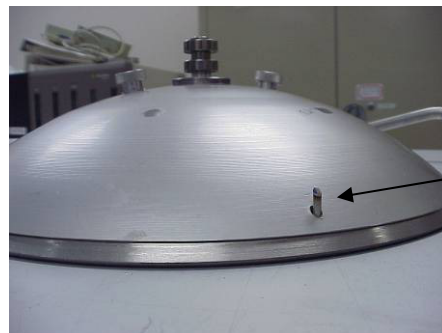


## 6.3.1.4 Separate planetary



## 6.3.1.5 Load wafers device side down. Fill open holes with dummy wafer

## 6.3.1.6 Reassemble planetary making sure to put guide pin in hole.

6.3.1.7 Screw backing nut onto planetary. **Do not overtighten!**

6.3.1.8 Reinstall holding arm over bearings.



6.3.1.9 Re-install retaining clip into slot on holding arm. Pull up on holding arm to insure that clip is engaged.



6.3.1.9.1 Re-install planetary. (use caution- the planetary may fall off the holding arm and break your wafers) Spin unit to ensure proper seating



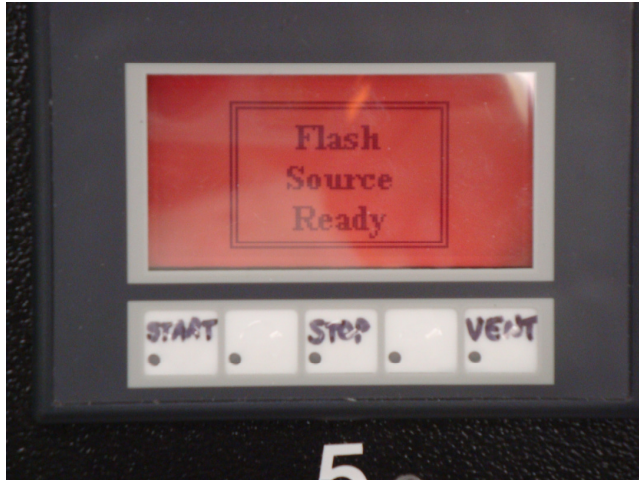


Spin

- 6.3.1 Wipe down base plate and bell jar gasket with crew wipe and IPA.
- 6.3.2 **Panel 1** – Close Bell Jar by holding both switches in the down position.
  - 6.3.2.1 Bell Jar will stop at bottom.
- 6.3.3 **Panel 6** – Turn on Rough Pump Power Switch.
- 6.3.4 **Panel 12** – On the lower left of the tool, verify that the two green LEDs for the **Cardswipe** and **Cardswipe Latch** are lit. If not please consult a tool technician.
- 6.3.5 **Panel 5** – Press <START> on Control Panel.
- 6.3.6 **Panel 12** – Evacuation of Bell Jar is started. This is indicated by ROUGH light illuminating.
- 6.3.7 **Panel 7** – Ensure Pirani Gauge Controller is decreasing in pressure.
- 6.3.8 **Panel 7** – When Pirani Gauge Controller displays  $4.0 \times 10^{-2}$  unit will advance to HiVac.
- 6.3.9 **Panel 12** – This is indicated by the Rough light extinguishing and the HiVac light illuminating.
- 6.3.10 **Panel 6** – Turn off Rough Power Switch.
- 6.3.11 **Panel 2** – Press <GUAGE> on GP 330 Ionization Guage Controller. After a few seconds units will display a numerical reading.
- 6.3.12 **When GP 330 Ionization Guage Controller displays  $3 \times 10^{-5}$ , Flash Source will be able to be run. If the unit pressure goes above during deposition Flash Source will be shut off until proper vacuum is achieved.**

## 6.5 Evaporation

6.5.1 **Panel 5** – Screen on Control Panel Should display:



6.5.2 **Panel 12** – HiVolt and HiVac lights should be illuminated. If not get a technician.

6.5.3 **Panel 2** – Monitor film thickness on Inficon Film Thickness Monitor. This is in thousands of Å at display (1.000 = 1000Å)

6.5.4 **Panel 3** – Press <STOP> on Inficon Film Thickness Monitor to close shutter.

6.5.5 **Panel 10** – Turn on Planetary Rotation Switch. Speed can be adjusted by trim pot to the right of the switch. Standard speed is set at 8.



### **MANUAL ENDPOINT SHUTTER**

6.5.6 **Panel 11** – Turn on Main Breaker on CHA Industries Deposition Controller. **Vacuum**, **Water**, and **Power** lights should illuminate. If not get a technician.

6.5.7 **Panel 11** – Press <START> button.

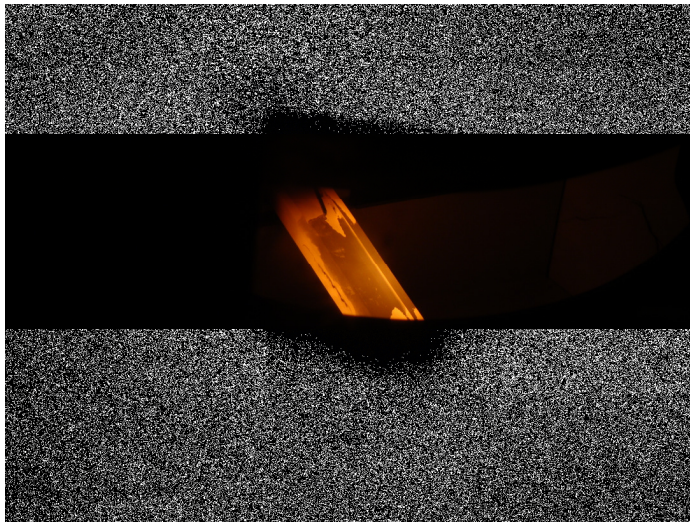
6.5.8 **Panel 11** – Adjust Voltage Knob to **0-200A/0-50V** Left position on knob.

6.5.9 **Panel 11** – Set deposition switch to **Current**.

6.5.10 **Panel 11** – Auto/Manual Switch to manual.

6.5.11 **Panel 11** – Control Knob will increase/decrease current to Flash Source boat.

- 6.5.12 **Panel 11** – Start increasing current to indicate 150A on lower scaling range of panel display.
- 6.5.13 **Panel 11** – Watch inside bell jar for boat to glow.
- 6.5.14 **Panel 11** – Once boat begins to glow turn current up to approximately 180A.
- 6.5.15 **Panel 8** – Advance Al with wheel so that some Al wire is positioned on the boat.
- 6.5.16 **Wait for the Al wire to melt off onto boat.**
- 6.5.17 **When wire melts it will “wet” and disperse across the boat. At this time you will have to continually watch the boat for Al evaporation to occur.**



- 6.5.18 **Panel 3** – As Al starts to evaporate press the #3 button on the Inficon Film Thickness Monitor. This will zero the controller.
- 6.5.19 **Panel 3**– Press <RESET> then <START> on Inficon Film Thickness Monitor to open shutter.
- 6.5.20 **You need to watch the boat for evaporation** this will display on the Inficon Film Thickness Monitor.

As evaporation occurs slowly feed enough Al wire as to “re-wet” the boat. The wire will melt instantly and evaporation will occur rapidly.

- 6.5.21 **Panel 3** – Watch the Inficon Film Thickness Monitor to ensure that you get your desired amount deposited.

Repeat step 6.5.21 until desired amount is displayed on the Inficon Film Thickness Monitor.

6.5.22 **Panel 3** – Press <**STOP**> on Inficon Film Thickness Monitor to close shutter.

**DO NOT FEED ANY MORE WIRE**  
**Proceed to step 6.5.40**

### **AUTOMATIC ENDPOINT SHUTTER**

6.5.23 **Panel 3** – To enter final film thickness press <**PROGRAM**>

6.5.24 **Panel 3** – Press <**E**> until Final Thk is highlighted. Enter in desired deposition amount on keypad and press<**E**>.

6.5.25 **Panel 3** – Press <**PROGRAM**> to return to the main screen.

6.5.26 **Panel 12** – On the lower left of the tool verify that all 4 green LEDs are lit for the **Cardswipe, Cardswipe Latch, H<sub>2</sub>O** and **IG**.

6.5.27 **Panel 11** – Turn on Main Breaker on CHA Industries Deposition Controller. **Vacuum, Water, and Power** lights should illuminate. If not get a technician.

6.5.28 **Panel 11** – Press <**START**> button.

6.5.29 **Panel 11** – Adjust Voltage Knob to **0-200A/0-50V** Left position on knob.

6.5.30 **Panel 11** – Set deposition switch to **Current**.

6.5.31 **Panel 11** – Auto/Manual Switch to manual.

6.5.32 **Panel 11** – Control Knob will increase/decrease current to Flash Source boat.

6.5.33 **Panel 11** – Start increasing current to indicate 150A on lower scaling range of panel display.

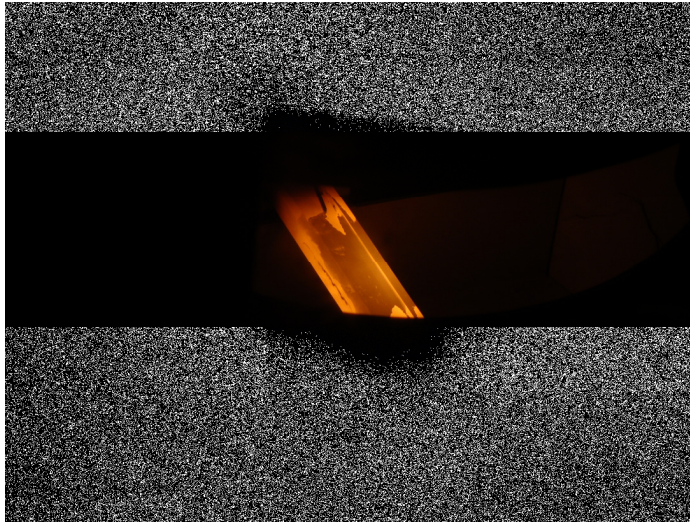
6.5.34 **Panel 11** – Watch inside bell jar for boat to glow.

6.5.35 **Panel 11** – Once boat begins to glow turn current up to approximately 180A.

6.5.36 **Panel 8** – Advance Al with wheel so that some Al wire is positioned on the boat.

6.5.37 **Wait for the Al wire to melt off onto boat.**

6.5.38 **When wire melts it will “wet” and disperse across the boat. At this time you will have to continually watch the boat for Al evaporation to occur.**



6.5.39 **Panel 3**– After Al starts to evaporate press <RESET> <START> on Inficon Film Thickness Monitor to open shutter. This will zero the unit automatically.

6.5.40 **You need to watch the boat for evaporation** this will display on the Inficon Film Thickness Monitor.

As evaporation occurs slowly feed enough Al wire as to “re-wet” the boat. The wire will melt instantly and evaporation will occur rapidly.

**SHUTTER WILL AUTOMATICALLY CLOSE WHEN  
DESIRED AMOUNT OF AL IS OBTAINED**

**DO NOT FEED ANY MORE WIRE**

6.5.41 **Panel 10** – Turn off Rotostrate.

- 6.5.42 **Observe the boat.** When there is no more Al on the boat you may start to turn down the current. If you do not evaporate the entire Al off the boat prior to turning down the current the boat will get overloaded and the unit will not work.
- 6.5.43 **Panel 11** – Turn down the Control Knob on the CHA Industries Deposition Controller.
- 6.5.44 **Panel 11** – Turn off the Main Breaker on the Deposition Controller.
- 6.5.45 **Panel 3** – Annotate, for your own records, the amount displayed on the Inficon Film Thickness Monitor.

## 6.6 Unloading Wafers

- 6.6.2 **Panel 2** – Press <GAUGE> on the GP 330 Ionization Gauge Controller. Unit should not display.
- 6.6.3 **Panel 5** – Press <STOP> on the Control Panel.
- 6.6.4 **Panel 5** – Press <VENT> on the Control Panel.
- 6.6.5 **Panel 12** - HiVac Valve will close indicated by light going out.
- 6.6.6 **Panel 12** - After 30sec Vent will initialize indicated by the Vent light illuminating.
- 6.6.7 **Panel 7** - Observe Pirani Gauge Controller. Pressure should be rising. Unit is vented when N<sub>2</sub> is heard escaping from bell jar.
- 6.6.8 **Panel 1** - Operate both switches to the up position simultaneously to raise the bell jar.

**Bell Jar will not rise without both switches activated  
at the same time.**

- 6.6.9 Open Bell Jar until it stops. This may seem hi but it will stop.
- 6.6.10 **Panel 5** - Press <STOP> on the Control Panel.
- 6.6.11 Remove Planetary and wafers as previously described.

- 6.6.12 Re-install planetary. Spin unit to ensure proper seating.
- 6.6.13 Wipe down base plate and bell jar gasket with crew wipe and IPA.
- 6.6.14 **Panel 1** – Lower Bell Jar by moving both switches to the down position and holding them. Bell Jar will stop at bottom.
- 6.6.15 **Panel 6** – Turn on Rough Power.
- 6.6.16 **Panel 5** – Press <START> on Control Panel.
- 6.6.17 **Panel 12** – Evacuation of the Bell Jar is started. This is indicated by ROUGH light illuminating.
- 6.6.18 **Panel 7** – Ensure Pirani Gauge decreases in pressure.
- 6.6.19 **Panel 7** – When Pirani Gauge displays  $4.0 \times 10^{-2}$  unit will advance to HiVac.
- 6.6.20 **Panel 12** – This is indicated by ROUGH light extinguishing and the HiVac light illuminating.
- 6.6.21 **Panel 6** – Turn off Rough Power switch.
- 6.6.22 **Panel 2** – Press <GAUGE> on GP 330 Ionization Gauge Controller. After a few seconds units will display a numerical reading.
- 6.6.23 Turn off the Vent N<sub>2</sub> for **CHA Flash Source** behind tool. (Green handle inside lower section of wall behind tool labeled **CHA FLASH NITROGEN.**)

## 6.7 Stand By

- 6.7.1 Once unit is in HiVac, system is then in a safe stand-by condition.
- 6.7.2 Swipe out of tool.



## 7 APPROPRIATE USES OF THE TOOL

7.3 To avoid contamination of the system, use only clean wafers and approved evaporation sources.



7.2 Deposition thickness of materials is limited by adhesion strength of the material to the substrate, and tensile or compressive stresses developed in the film. Maximum film thicknesses of **1 micron** are typical for most materials. **Consult SMFL staff if you desire to deposit films thicker than 1 micron.**

### REVISION RECORD

Summary of Changes	Originator	Rev/Date
Original Issue	Richard L Battaglia	A-03/04/2009
Removed 5.2.6 section about delay timer.	Sean O'Brien	B-08/20/2009
Added 6.3.4 and 6.5.26 about indicator lights	Sean O'Brien	C-05/28/2010
Updated Nitrogen valve location.	Kelly Johnson	D-01/17/2011
Updated Inficon Film Thickness Monitor and GP Ionization Gauge Controller	Richard L Battaglia	E-02/17/2015